

**We Claim:**

1.

A charge forming apparatus for an internal combustion engine comprising:

a body

a fuel-and-air mixing passage defined by the body, the mixing passage having a venturi region disposed between an air inlet region and a mixture outlet region, wherein air flows from a near atmospheric air source through the air inlet region and into the engine from the mixture outlet region;

a throttling choke valve disposed in the air inlet region of the mixing passage, the throttling choke valve having a closed position for starting of the engine, an idle position and a full open position;

a flexible diaphragm having a first surface, an opposite second surface, and a peripheral edge;

a fuel metering chamber defined between the body and the first surface;

a fuel feed passage communicating between the fuel metering chamber and the venturi region of the mixing passage, wherein liquid fuel flows into the venturi region for mixing with air flowing from the air inlet region;

a cover;

a reference chamber defined between the second surface and the cover, wherein the peripheral edge is engaged sealably between the cover and the body; and

a reference passage communicating between the reference chamber and the air inlet region downstream of the throttling choke valve when in the idle position.

**2.**

The charge forming apparatus set forth in Claim 1 comprising an air bypass channel communicating between the near atmospheric air source and the mixing passage downstream of the choke valve.

**3.**

The charge forming apparatus set forth in Claim 2 wherein the air bypass channel communicates directly with the mixture outlet region of the mixing passage.

**4.**

The charge forming apparatus set forth in Claim 3 wherein the air bypass channel is defined by the body.

**5.**

The charge forming apparatus set forth in claim 4 comprising an air bypass screw engaged threadably to the body and projecting adjustably into the air bypass channel for adjusting the air flow bypassing the throttling choke valve and the venturi region of the mixing passage.

**6.**

The charge forming apparatus set forth in claim 1 comprising a mixture needle screw engaged threadably to the body and projecting adjustably into the fuel feed passage for adjusting fuel flow into the venturi region of the mixing passage from the fuel metering chamber.

7.

The charge forming apparatus set forth in claim 1 comprising an isolation valve constructed and arranged to vent the reference chamber to the near atmospheric air source when the throttling choke valve is not in the idle position.

8.

The charge forming apparatus set forth in claim 7 wherein the isolation valve is in an open state when the throttling choke valve is not in the idle position and in a closed state when the throttling choke valve is in the idle position.

9.

The charge forming apparatus set forth in claim 8 comprising:

a valve chamber of the isolation valve carried in-part by the body;

a first leg of the reference passage communicating between the reference chamber and the valve chamber;

a second leg of the reference passage communicating between the valve chamber and the air inlet region downstream of the throttling choke valve;

a vent passage defined by the body and communicating between the valve chamber and the near atmospheric air source; and

wherein an actuating member of the isolation valve isolates the vent passage from the valve chamber when in the closed state.

**10.**

The charge forming apparatus set forth in claim 9 wherein the isolation valve is a solenoid valve having a valve seat carried by the body within the valve chamber, a valve head being the actuating member constructed and arranged to engage the valve seat when in the closed state and disengage from the valve seat when in the open state.

**11.**

The charge forming apparatus set forth in claim 10 wherein the solenoid valve is energized when in the closed state.

**12.**

The charge forming apparatus set forth in claim 10 wherein the valve head moves linearly into the valve chamber.

**13.**

The charge forming apparatus set forth in claim 9 wherein the isolation valve is integral to the throttling choke valve.

**14.**

The charge forming apparatus set forth in claim 13 comprising:

a shaft of the throttling choke valve seated rotateably within a bore defined by the body which communicates transversely through the air inlet region of the mixing passage; and

a pivoting plate of the throttling choke valve engaged rigidly to the shaft within the air inlet region for obstructing the air inlet region when in the closed position.

**15.**

The charge forming apparatus set forth in claim 14 wherein the bore has the valve chamber and the rotating shaft is the actuating member of the isolation valve.

**16.**

The charge forming apparatus set forth in claim 15 wherein the shaft carries a recess open radially outward and aligned axially to the valve chamber with respect to the bore.

**17.**

The charge forming apparatus set forth in claim 16 wherein the vent passage is misaligned circumferentially to the recess and isolated from the valve chamber by the shaft when the isolation valve is in the closed state.

**18.**

The charge forming apparatus set forth in claim 16 wherein the second leg of the reference passage is misaligned circumferentially to the recess and isolated from the valve chamber by the shaft when the isolation valve is in the open state and the throttling choke valve is in the closed position.

**19.**

The charge forming apparatus set forth in claim 17 wherein the second leg of the reference passage is misaligned circumferentially to the recess and isolated from the valve chamber by the shaft when the isolation valve is in the open state and the throttling choke valve is in the closed position.

**20.**

A carburetor for an internal combustion engine comprising:

a body

a fuel-and-air mixing passage defined by the body, the mixing passage having a venturi region disposed between an air inlet region and a mixture outlet region, wherein air flows through the inlet region and into the engine from the outlet region;

a throttling choke valve disposed in the inlet region of the mixing passage, the throttling choke valve having a closed position for starting of the engine, an idle position and a full open position;

a fuel metering system for flowing liquid fuel via a fuel feed passage to the venturi region;

a reference passage communicating between the fuel metering system and the air inlet region downstream of the throttling choke valve when in the idle position; and

wherein fuel flow through the fuel feed passage is reduced when a dry reference chamber of the fuel metering system is exposed to negative pressure via the reference passage.

**21.**

The charge forming apparatus set forth in Claim 20 comprising an air bypass channel communicating between the air inlet region upstream of the throttling choke valve and the mixture outlet region of the mixing passage.

**22.**

The charge forming apparatus set forth in claim 21 comprising an air bypass screw engaged threadably to the body and projecting adjustably into the air bypass channel for adjusting the air flow bypassing the throttling choke valve and the venturi region of the mixing passage.

**23.**

A charge forming apparatus for a combustion engine comprising:

a body;

a fuel-and-air mixing passage having a venturi region disposed downstream of an air inlet region defined by a wall carried by the body;

a throttling choke valve disposed pivotally in the air inlet region;

a fuel metering system for flowing fuel via a fuel feed passage to the venturi region, wherein a negative pressure created in the venturi region promotes fuel flow through the fuel feed passage;

a reference passage communicating between the fuel metering system and the air inlet region downstream of the throttling choke valve;

a secondary venturi disposed upstream of the venturi region and defined by the throttling choke valve and the wall; and

wherein a negative pressure created at the secondary venturi is transmitted to the fuel metering system via the reference passage for limiting fuel flow through the fuel feed passage.

**24.**

The change forming apparatus set forth in claim 23 wherein a throttle valve is not disposed downstream of the venturi region.